

HE
18.5
.A34
no.
DOT-
TSC-
NHTSA-
78-16

RT NOS. DOT-TSC-NHTSA-78-16

HS-803 332

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES
IN THE UNITED STATES

Second Series - Report No. 5
1977 Ford 140 CID (2.3 Liters), 2V

D. E. Koehler
T. W. Chamberlain
K. R. Stamper
W. F. Marshall

U.S. DEPARTMENT OF ENERGY
BARTLESVILLE ENERGY RESEARCH CENTER
P.O. Box 1398
Bartlesville OK 74003



MAY 1978

INTERIM REPORT

Dept. of Transportation

OCT 4 1978

Library

DOCUMENT IS AVAILABLE TO THE U.S. PUBLIC
THROUGH THE NATIONAL TECHNICAL
INFORMATION SERVICE, SPRINGFIELD,
VIRGINIA 22161

Prepared for
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
Washington DC 20590

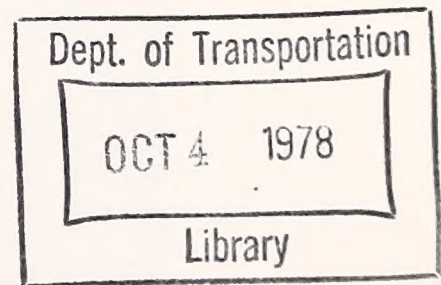
NOTICE

Work reported herein was done under sponsorship of the Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

NOTICE

The United States Government does not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the object of this report.

1. Report No. HS-803 332	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES Second Series - Report No. 5 1977 Ford 140 CID (2.3 Liters), 2V		5. Report Date May 1978	
		6. Performing Organization Code	
7. Author(s) T. W. Chamberlain, D. E. Koehler, K. R. Stamper and W. F. Marshall		8. Performing Organization Report No. DOT-TSC-NHTSA-78-16 BERC/OP-77/57	
9. Performing Organization Name and Address U.S. Department of Energy* Bartlesville Energy Research Center P.O. Box 1398 Bartlesville OK 74003		10. Work Unit No. (TRAIS) HS827/R8402	
		11. Contract or Grant No. RA-76-23	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Research and Development Office of Passenger Vehicle Research Technology Assessment Division Washington DC 20590		13. Type of Report and Period Covered Interim Report November 1977	
		14. Sponsoring Agency Code	
15. Supplementary Notes *Interagency agreement with:		U.S. Department of Transportation Transportation Systems Center Kendall Square Cambridge MA 02142	
16. Abstract Experimental data were obtained in dynamometer tests of a 1977 Ford 2.3 liter (140 CID) engine to determine fuel consumption and emissions (hydrocarbon, carbon monoxide, oxides of nitrogen) at steady-state engine-operating modes. The objective of the program is to obtain engine performance data for estimating emissions and fuel economy for varied engine service and duty. The intent of the work is to provide basic engine characteristic data required as input for engineering calculations involving ground transportation.			
17. Key Words Fuel Economy Auto Emissions		18. Distribution Statement DOCUMENT IS AVAILABLE TO THE U.S. PUBLIC THROUGH THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VIRGINIA 22161	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 60	22. Price



PREFACE

This report, prepared by the U.S. Department of Energy, Bartlesville Energy Research Center, for the U.S. Department of Transportation, Transportation Systems Center, Energy Technology Branch, Cambridge MA, presents results of experimental work to obtain information on performance characteristics of an engine used in automobiles sold in the U.S. The engine used in this work is one of a series of 10 engines to be tested in the current program. This is the fifth of the reports to be published covering work with those engines.

This project is funded by the National Highway Traffic Safety Administration, Office of Research and Development, Office of Passenger Vehicle Research, Technology Assessment Division.

Ralph G. Colello and James A. Kidd, Jr., of the U.S. Department of Transportation, Transportation Systems Center, are the technical monitors.

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol When You Know Multiply by To Find Symbol

LENGTH

in	inches	2.5	cm	centimeters
ft	feet	30	m	meters
yd	yards	0.9	km	kilometers
mi	miles	1.6		

AREA

m ²	square inches	6.5	cm ²	square centimeters
ft ²	square feet	0.09	m ²	square meters
yd ²	square yards	0.8	km ²	square kilometers
mi ²	square miles	2.6	ha	hectares
	acres	0.4		

MASS (weight)

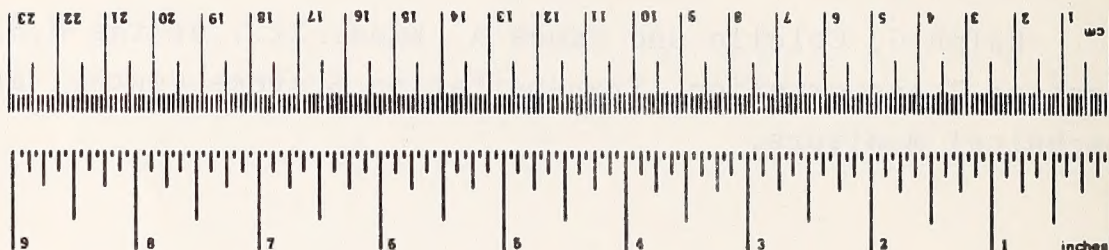
oz	ounces	28	g	grams
lb	pounds	0.45	kg	kilograms
	short tons (2000 lb)	0.9	t	tonnes

VOLUME

tsp	teaspoons	5	ml	milliliters
fl oz	fluid ounces	15	ml	milliliters
c	cups	30	l	liters
pt	pints	0.24	l	liters
qt	quarts	0.47	l	liters
gal	gallons	0.95	l	liters
ft ³	cubic feet	3.8	m ³	cubic meters
yd ³	cubic yards	0.03	m ³	cubic meters
		0.76		

TEMPERATURE (exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	°C	Celsius temperature
----	------------------------	----------------------------	----	---------------------



Approximate Conversions from Metric Measures

Symbol When You Know Multiply by To Find Symbol

LENGTH

mm	millimeters	0.04	in	inches
cm	centimeters	0.4	in	inches
m	meters	3.3	ft	feet
km	kilometers	1.1	yd	yards
		0.6	mi	miles

AREA

cm ²	square centimeters	0.16	in ²	square inches
m ²	square meters	1.2	yd ²	square yards
km ²	square kilometers	0.4	mi ²	square miles
ha	hectares (10,000 m ²)	2.5		acres

MASS (weight)

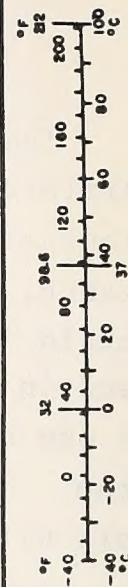
g	grams	0.035	oz	ounces
kg	kilograms	2.2	lb	pounds
t	tonnes (1000 kg)	1.1		short tons

VOLUME

ml	milliliters	0.03	fl oz	fluid ounces
l	liters	2.1	pt	pints
		1.06	qt	quarts
m ³	cubic meters	0.26	gal	gallons
		35	ft ³	cubic feet
		1.3	yd ³	cubic yards

TEMPERATURE (exact)

°C	Celsius temperature	9/5 (then add 32)	°F	Fahrenheit temperature
----	---------------------	-------------------	----	------------------------



1. INTRODUCTION

Data acquired from steady-state tests of a 1977 Ford 2.3 liter (140 cubic-inch-displacement) engine are presented in this report. The test results are sufficient to establish maps of fuel consumption and emissions of carbon monoxide, unburned hydrocarbons, and oxides of nitrogen over the operating range of the engine.

The Ford 2.3 liter engine is one of a series of 10 engines to be tested in the current program. The steady-state maps of emissions and fuel economy generated by this study may be used to predict engine and emission control system performance for transient operation.

2. ENGINE TEST REPORT

A new mean-tolerance 1977 Ford 2.3 liter engine was acquired for this series of tests. The engine was mounted on a test stand and coupled to an eddy-current dynamometer. All engine accessories were included in the test stand installation except for the cooling fan and radiator. An alternator was mounted on the engine but was not connected to the electrical system. Emission control systems included exhaust-gas recirculation and oxidation catalyst. Table 1 contains the manufacturer's general specifications for the Ford 2.3 liter engine.

Prior to the start of the testing program, the engine was broken in at speeds and power settings comparable to normal vehicle operation. Table 2 contains details of the break-in schedule that was used. A single batch of unleaded, regular grade gasoline was used for the entire break-in period and test program. An analysis of the fuel appears in table 3.

Steady-state tests of the engine were made at the speed and load points indicated in table 4. The following data items were recorded at each test point:

- Test number
- Date
- Barometric pressure, mm Hg
- Dew point, °F
- Inlet air temperature, °F
- Speed, rpm
- Torque, lb-ft -- BLH strain gage load cell; Daytronics indicator
- Fuel rate, lb/hr -- Fluidyne positive displacement fuel flowmeter
- Ignition timing, °BTC
- Manifold vacuum, in. Hg
- Throttle angle, deg
- CO, pct -- Beckman NDIR
- CO₂, pct -- Beckman NDIR
- O₂, pct -- Beckman polarographic detector
- HC, ppmC -- Custom-built heated flame ionization detector
- NO_x, ppm -- Thermo-Electron chemiluminescent detector
- Oil temperature, °F
- Oil pressure, psig
- Coolant temperature, °F
- Exhaust temperature, °F
- Exhaust pressure, in. H₂O
- Intake manifold temperature, °F.

The following equations were used in calculating power, air/fuel ratio, absolute humidity, and mass emission rates of carbon monoxide (CO), unburned hydrocarbons (HC), and oxides of nitrogen (NO_x):

1. Partial pressure of water vapor in intake air (millimeters of mercury):

$$P = \exp \left[18.717 - \frac{7308.1}{393 + D} \right] ,$$

where D = dewpoint, °F.

2. Absolute humidity (grains moisture per pound dry air):

$$H = \frac{4347.8(P)}{B - P} ,$$

where B = barometric pressure, mm Hg.

3. Humidity correction factor (dimensionless):

$$K_H = \frac{1}{1 - 0.0047(H - 75)} .$$

Note: This factor is used to correct the NO_x mass emission rate to a standard humidity of 75 grains moisture per pound dry air.

4. Stoichiometric air/fuel ratio (dimensionless):

$$AF_s = \frac{69(2 + \frac{x}{2} - y)}{MW_{fuel}} ,$$

where x = hydrogen-carbon atomic ratio of fuel,
 y = oxygen-carbon atomic ratio of fuel,
 MW_{fuel} = fuel molecular weight per carbon atom,
 $= 12.01115 + 1.00797x + 15.9994y$.

5. Hydrogen concentration in raw exhaust (percent):

$$H_2 = \frac{x(CO)(CO + CO_2)}{2(CO + 3CO_2)} ,$$

where CO = carbon-monoxide concentration (percent),
 CO_2 = carbon-dioxide concentration (percent).

Note: This equation assumes a water-gas shift equilibrium constant

$$\frac{(CO)(H_2O)}{(CO_2)(H_2)} = 3.$$

6. Correction factor for emission concentrations from wet basis to dry basis (dimensionless):

$$C_w = 1 + \frac{(\frac{x}{2})(CO + CO_2) - H_2}{100}.$$

Note: In these tests only HC is measured on a wet basis.
All other species are measured on a dry basis.

7. Air/fuel ratio (dimensionless):

$$AF = \frac{AF_s}{2 + \frac{x}{2} - y} \left[\frac{(1 + \frac{x}{2} - y)(CO) + (2 + \frac{x}{2} - y)(CO_2) + 2(O_2) + \frac{NO_x}{10^4} - H_2}{CO + CO_2 + C_w (\frac{HC}{10^4})} \right],$$

where O_2 = oxygen concentration (percent),
 NO_x = oxides of nitrogen (ppm),
HC = unburned hydrocarbon concentration (ppmC).

8. Exhaust flow (pounds per hour):

$$M_{EX} = M_F(1 + AF).$$

where M_F = fuel flow rate (pounds per hour).

9. Carbon monoxide mass emission rate (grams per hour):

$$M_{CO} = \frac{M_{EX}}{C_w} \left(\frac{CO}{100} \right) \left(\frac{MW_{CO}}{MW_{EX}} \right) 453.59237,$$

where MW_{CO} = molecular weight of CO (=28.01115),
 MW_{EX} = molecular weight of exhaust gas (=28.967).

10. Unburned hydrocarbon mass emission rate (grams per hour):

$$M_{HC} = M_{EX} \left(\frac{HC}{10^6} \right) \left(\frac{MW_{HC}}{MW_{EX}} \right) 453.59237,$$

where MW_{HC} = molecular weight per carbon atom of HC,
= 12.01115 + 1.00797x + 15.9994y.

11. Oxides of nitrogen mass emission rate (grams per hour):

$$i_{NO_x} = \frac{M_{EX}}{C_w} \left(\frac{NO_x}{10^6} \right) \left(\frac{MW_{NO_x}}{MW_{EX}} \right) (K_H) 453.59237,$$

where i_{NO_x} = molecular weight of NO_2 (=46.0028).

12. Power (brake horsepower corrected to a standard barometric pressure of 736.6 mm Hg and a standard temperature of 85° F):

$$HP = \frac{N(T)}{5252.113} \left(\frac{736.6}{B - P} \right) \sqrt{\frac{t + 460}{545}},$$

where N = engine speed (revolutions per minute),
 T = brake torque (foot-pounds),
 t = air temperature (°F).

3. DISCUSSION OF TEST RESULTS

The maximum torque and power outputs measured in these tests were in good agreement with the manufacturer's specifications (table 1). Emission rates of CO, HC, and NO_x were typical of modern spark ignition engines equipped with exhaust-gas-recirculation (EGR) systems and oxidation catalysts. The carburetor was set to provide a fuel-lean mixture during low power operation (figure 2), enabling the catalyst to control CO and HC effectively. At higher power levels, the air/fuel ratio tended to decrease, resulting in less effective catalytic treatment of CO and HC (figures 3 and 4). Oxides of nitrogen tended to reach a peak at about 60% of maximum power (figure 5). Beyond this power level, fuel rich engine operation tended to decrease NO_x emission rates. Fuel rate increased with increased BHP. See figure 6.

The data presented in this report are sufficient to establish steady-state maps of fuel consumption and emission rates for the 1977 Ford 2.3 liter engine.

4. CONCLUSIONS

The purpose of the experimental work reported here is to establish fuel consumption and emission rate data for this engine. Those data are presented in the tables accompanying this report.

TABLE 1. MANUFACTURER'S ENGINE SPECIFICATIONS

Displacement, cu. in.....	140
Maximum horsepower, bhp @ 5,000 rpm.....	92
Maximum torque, lb-ft @ 3,000 rpm.....	121
Bore and stroke, in.....	3.78 x 3.126
Configuration.....	in-line 4-cylinder
Compression ratio.....	9.0:1
Firing order.....	1-3-4-2
Ignition timing at idle speed, °BTDC @ 600 rpm.....	20
Block material.....	cast iron
Head material.....	cast iron
Number of crankshaft main bearings.....	5
Number of compression rings/piston.....	2
Number of oil rings/piston.....	1
Cam drive type.....	belt and sprocket
Valve lift:	
Intake, in.....	0.3997
Exhaust, in.....	0.3997
Valve timing:	
Intake opens, °BTC	22
Intake closes, °ABC.....	66
Exhaust opens, °BBC.....	64
Exhaust closes, °ATC.....	24
Spark plug gap, in.....	0.034
Engine weight, lb.....	250
Exhaust-gas-recirculation system:	
Valve type.....	tapered stem
Control signal.....	ported vacuum
Point of discharge.....	intake manifold
Crankcase emission control:	
Control method.....	positive crankcase ventilation
Point of discharge.....	intake manifold
Carburetor type.....	2V downdraft
Distributor specifications:	
Centrifugal advance, begins, ° @ 250 rpm.....	0
Centrifugal advance, intermediate, ° @ 1,000 rpm.....	0.5
Centrifugal advance, full, ° @ 2,500 rpm.....	6
Vacuum advance, begins, ° @ 2 in. Hg.....	10
Vacuum advance, maximum, ° @ 16 in. Hg.....	22
Carburetor number.....	D7EE-J4
EGR valve number.....	XE-196500-1115E
Distributor number.....	D7EE-12127-CA

TABLE 2. ENGINE BREAK-IN SCHEDULE

Simulated Vehicle Speed, mph	Engine Speed, rpm	Manifold Vacuum, in. Hg	Fraction of Time in Mode
0	Idle	14.5	1/10
20	1,300	15.2	"
30	1,600	12.2	"
40	2,050	12.8	"
50	2,450	11.8	"
60	2,950	10.4	"
25	1,400	13.7	"
35	1,800	12.4	"
45	2,225	12.4	"
55	2,650	11.5	"

Mileage per cycle = 90.

Total mileage accumulated over 42.5-hour break-in period = 1,530.

TABLE 3. FUEL SPECIFICATIONS

Fuel No.....	7619
Research octane No.....	91.5
Motor octane No.....	83.5
Specific gravity.....	0.7161
API gravity, deg.....	66.1
Distillation, °F:	
10 pct evaporated.....	128
50 pct ".....	218
95 pct ".....	404
100 pct ".....	417
Reid vapor pressure, psig.....	9.5
FIA analysis, pct:	
Aromatics.....	6
Olefins.....	17
Paraffins.....	77
Sulfur, pct.....	0.024
Lead, g/gal.....	Trace
Hydrogen/carbon atomic ratio.....	2.040
Oxygen/carbon atomic ratio.....	0.000

TABLE 4. TEST-NUMBER CROSS-REFERENCE INDEX

Pct Full Load	Engine Speed, rpm										
	650	750	1,000	1,500	2,000	2,500	3,000	3,500	4,300	5,000	5,300
0		1 72	14 78	22 83	30 88	31 39	47 98	103	63 104	71 113	
10			13 77	21 82	29 87	38 92	46 97	55 102	62 105	70 112	
25			12 76	20 81	28 86	37 91	45 96	54 101	61 106	69 111	
40			11 74	19 80	27 85	36 90	44 95	53 100	60 107	68 110	
60	4 73	2	10 114	18	26 178	35 178	43	52	59	67	
75			9 75	17 79	25 84	34 89	42 94	51 99	58 108	66 109	
90			8	16	24	33	41	50	57	65	
100	6	3	7	15	23	32	40	49	56	64	123

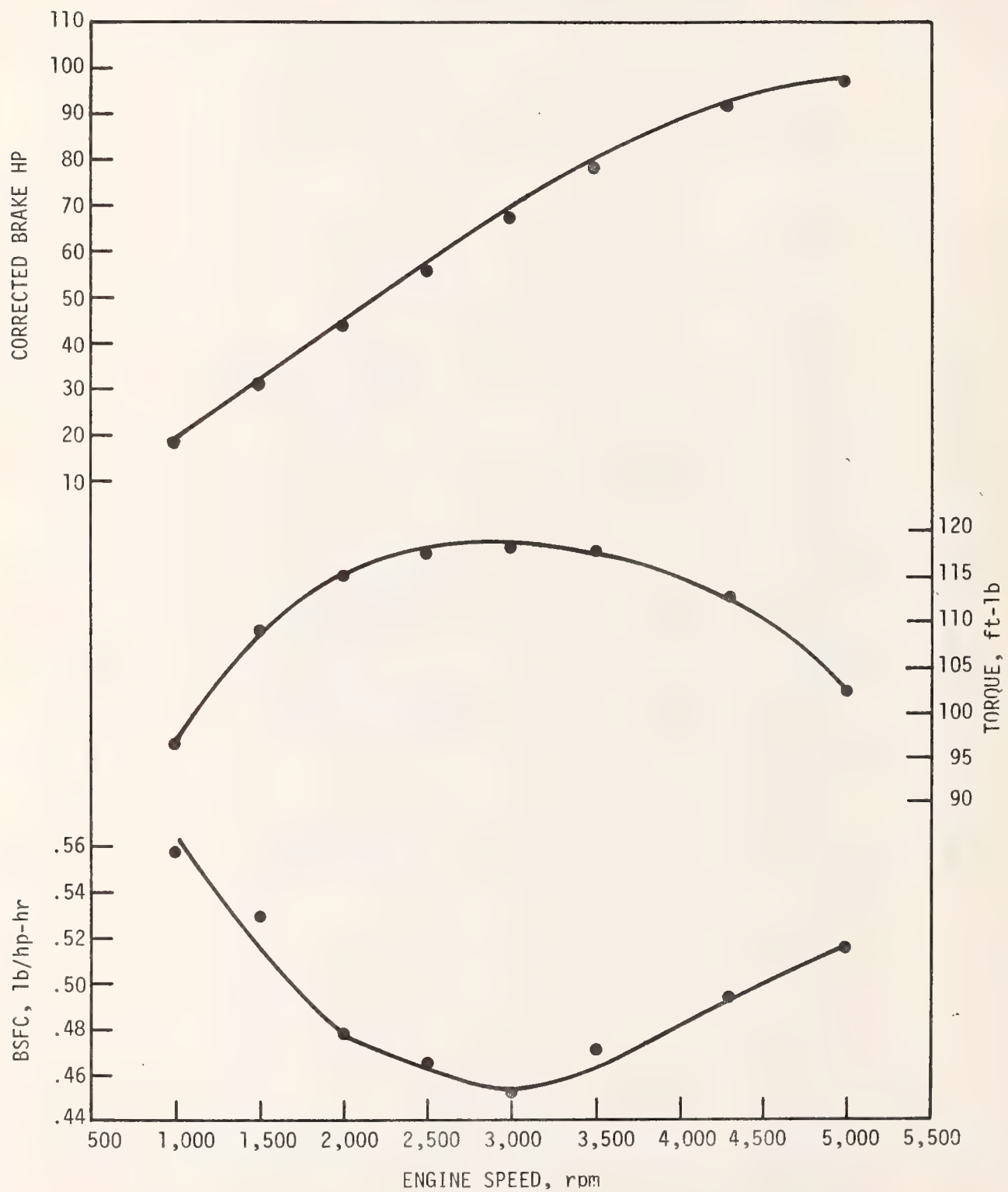


FIGURE 1. Brake Specific Fuel Consumption, Torque, and Brake Horsepower versus Engine rpm at Wide-Open-Throttle--Ford 2.3 liter Engine.

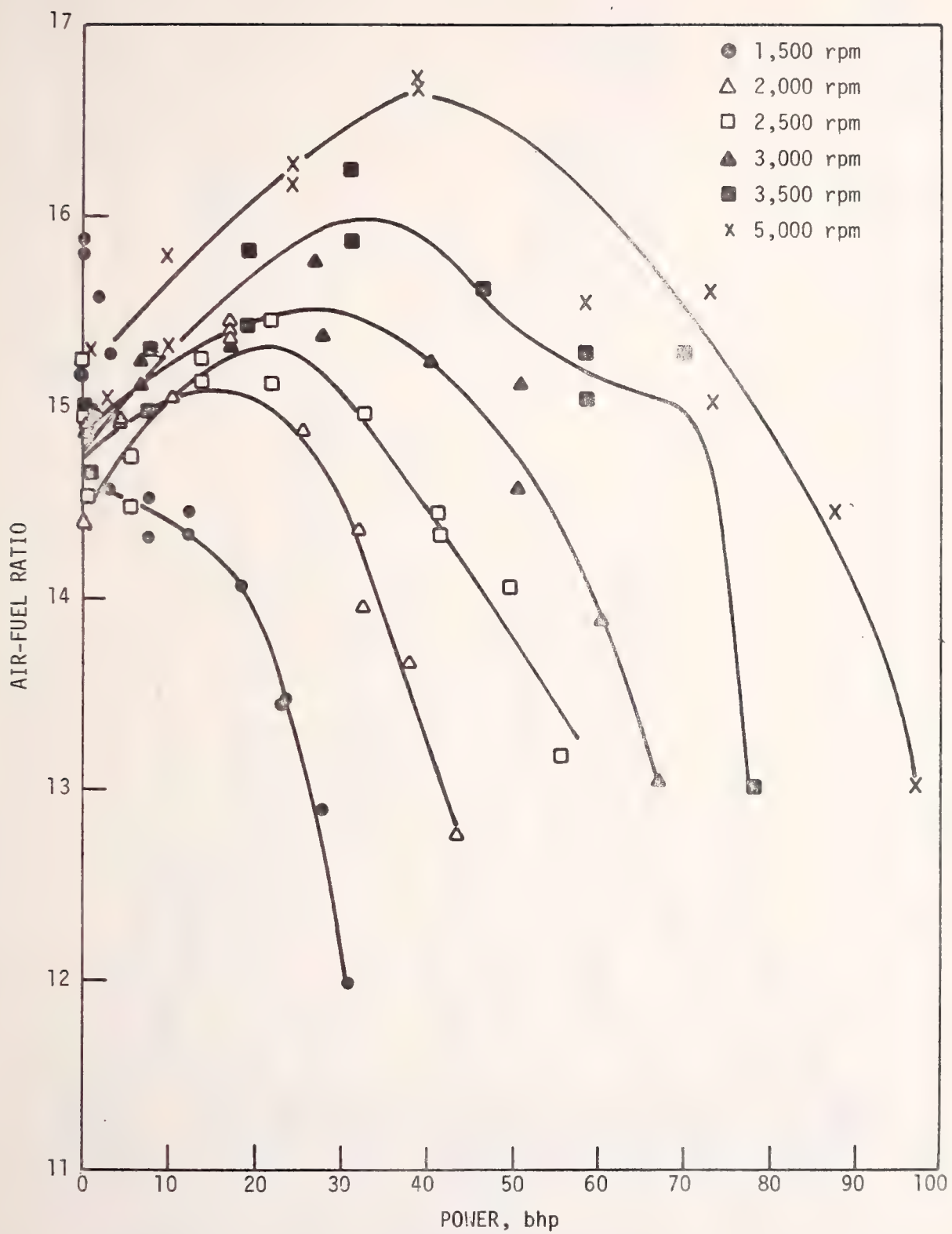


FIGURE 2. Air/Fuel Ratio versus Power at Various Speed and Load Conditions--Ford 2.3 liter Engine.

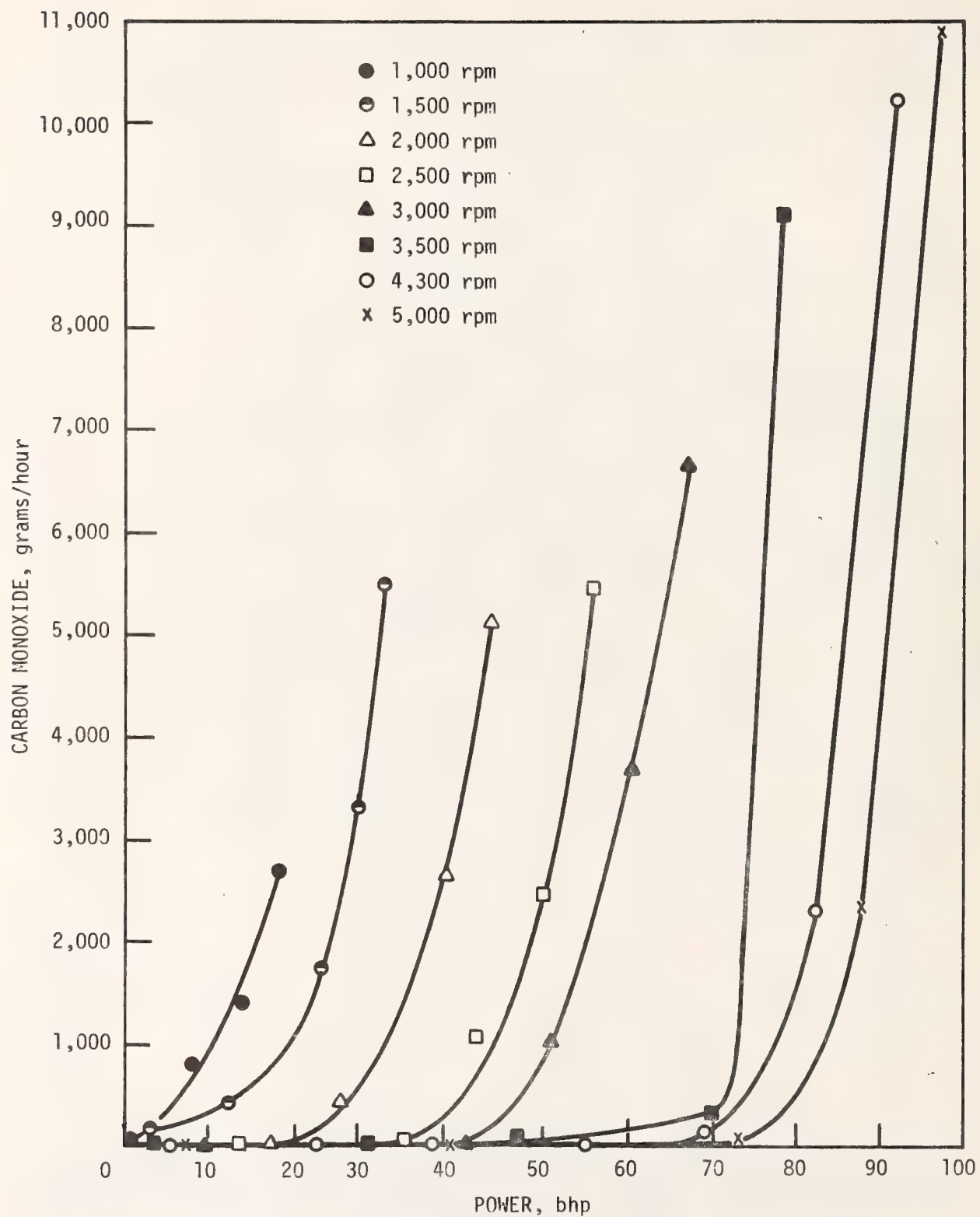


FIGURE 3. Carbon Monoxide Emissions versus Power at Various Speed and Load Conditions--Ford 2.3 liter Engine.

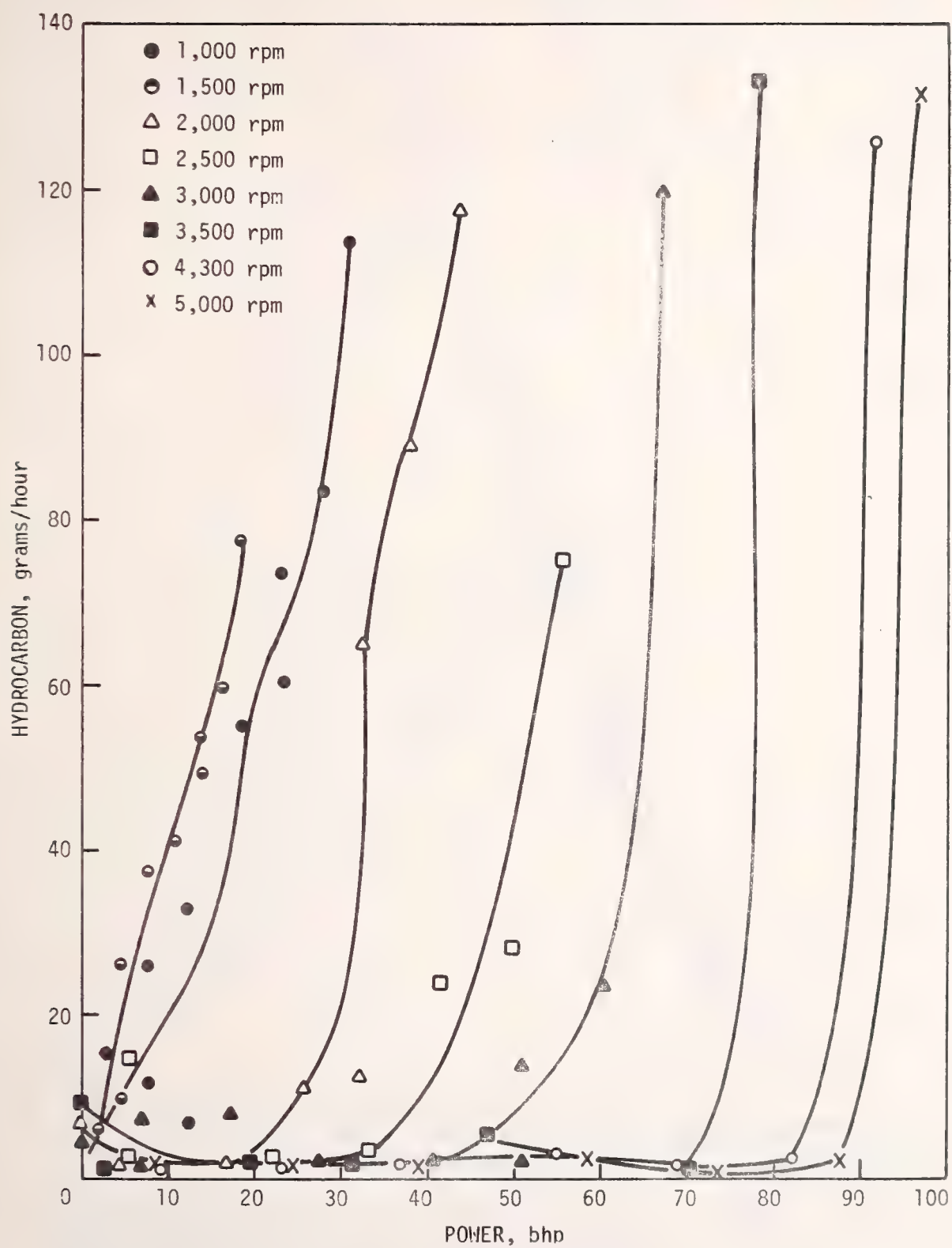


FIGURE 4. Hydrocarbon Emissions versus Power at Various Speed and Load Conditions-- Ford 2.3 liter Engine.

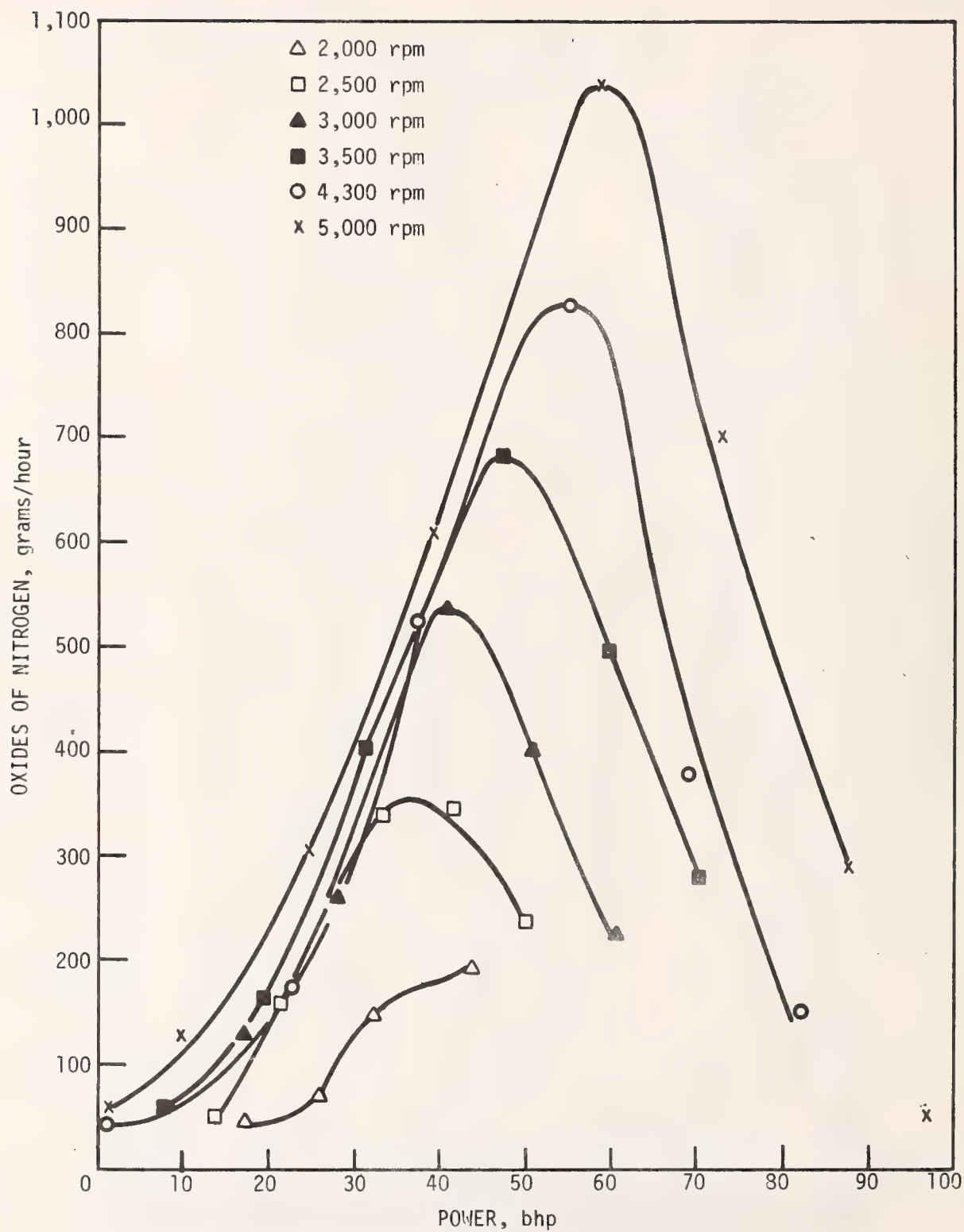


FIGURE 5. Oxides of Nitrogen Emissions versus power at Various Speed and Load Conditions-- Ford 2.3 liter Engine.

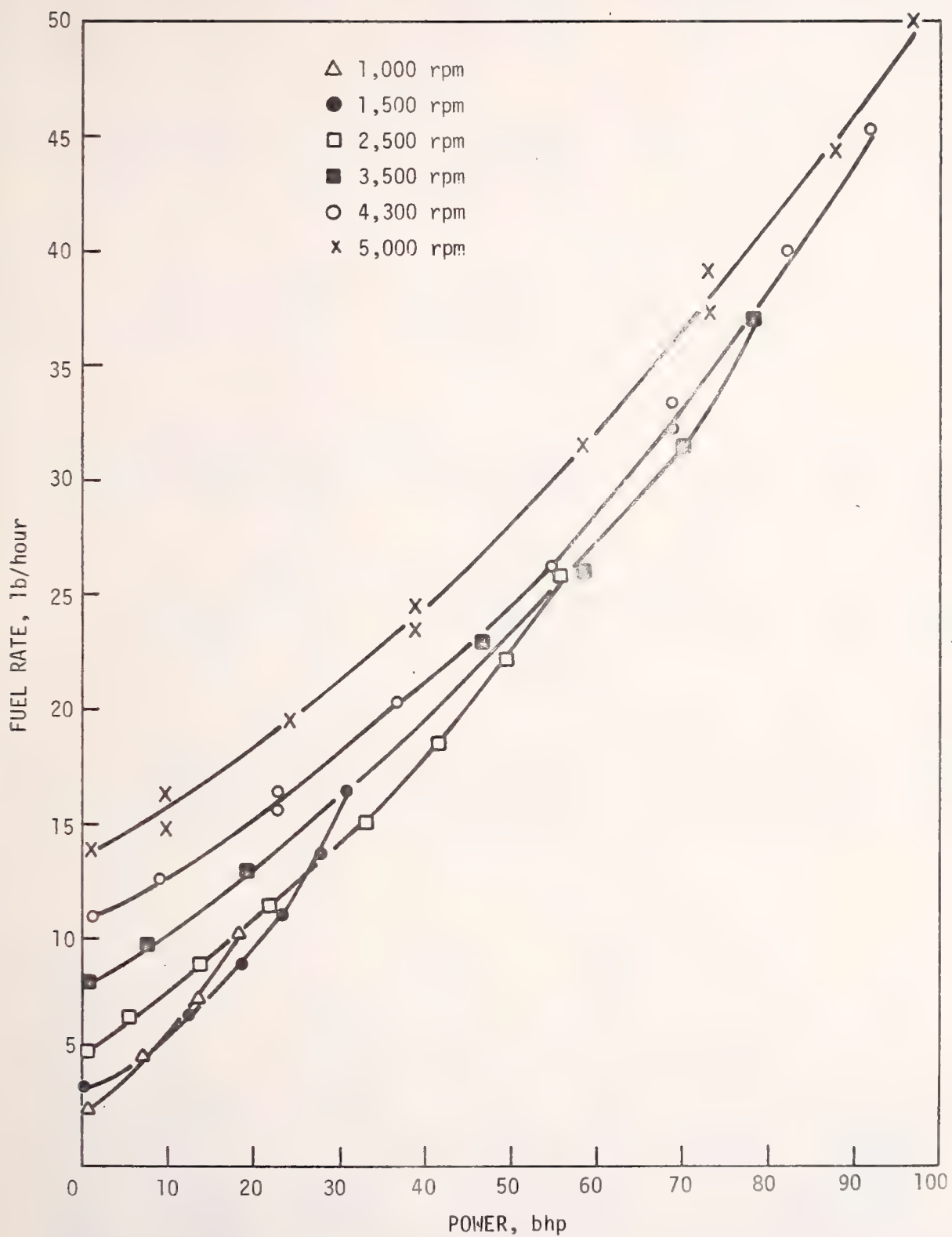


FIGURE 6. Fuel Rate versus Power at Various Speed and Load Conditions--Ford 2.3 liter Engine.

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO₂, %O₂, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H₂O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

1.1	1.2	2.1	2.2	3.1	3.2
3/ 1/77	3/ 1/77	3/ 1/77	3/ 1/77	3/ 1/77	3/ 1/77
746.8	746.8	746.8	746.8	746.8	746.8
36	36	34	34	34	34
76	76	76	76	76	76
750	750	750	750	750	750
1.0	1.0	10.0	10.0	20.0	20.0
1.1	1.1	1.4	1.4	2.8	2.8
1.9	1.8	1.9	2.1	2.5	2.5
20.0	20.0	20.0	20.0	20.0	20.0
18.5	18.5	16.0	16.0	16.0	16.0
.0	.0	.0	.0	.0	.0
118	118	118	118	108	108
1731	.0040	.2969	.0015	.3706	.0070
12.48	13.40	13.78	14.38	14.21	15.00
3.97	2.73	1.74	1.32	1.05	.29
6330	175	2258	169	2605	159
900	44	69	68	194	161
16.99	16.79	15.63	15.70	15.09	14.99
22.4	.5	35.1	.2	56.3	1.1
41.2	1.1	13.4	1.2	19.9	1.2
16.2	.7	1.1	1.3	4.1	3.3
183	183	178	178	180	180
41	41	39	39	41	41
185	178	178	178	180	180
.0	.0	.0	.0	.0	.0
668	656	588	634	600	517

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

4.1	5.1	5.2	6.1	6.2
3/ 1/77	3/ 1/77	3/ 1/77	3/ 2/77	3/ 2/77
746.8	746.8	746.8	746.4	746.4
34	34	34	48	48
77	76	76	77	77
650	650	650	650	650
13.3	20.0	20.0	30.0	30.0
1.6	2.4	2.4	3.7	3.7
1.9	2.1	2.1	2.6	2.6
20.0	20.0	20.0	20.0	20.0
16.0	15.5	15.5	13.7	13.8
.0	.0	.0	1.8	1.8
116	111	112	104	104

CONCENTRATIONS, DRY BASIS

.1391	.2832	.0056	1.6056	1.2077
13.45	14.06	14.65	14.11	14.39
2.37	1.44	.78	.52	.11
2985	2959	219	2854	2548
74	142	5	253	167

AIR/FUEL RATIO

16.11	15.33	15.31	14.20	14.14
-------	-------	-------	-------	-------

EMISSION RATES, G/HR

17.0	36.8	.7	240.4	100.0
18.3	19.3	1.4	21.5	19.1
1.2	2.6	.1	5.5	3.6

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

180	177	177	178	178
36	36	36	50	50
178	178	179	178	180
.0	1.0	.0	1.0	3.0
567	552	504	587	489

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

7.1	7.2	8.1	8.2	9.1	9.2
3/ 2/77	3/ 2/77	3/ 2/77	3/ 2/77	3/ 2/77	3/ 2/77
746.4	746.4	746.4	746.4	746.4	746.4
48	48	49	49	55	52
79	79	77	78	76	78
1000	1000	1000	1000	1000	1000
97.0	97.0	87.0	87.0	73.0	73.0
18.3	18.3	16.4	16.4	13.8	13.8
10.2	10.2	8.5	8.5	7.2	7.3
22.0	22.0	21.5	21.5	29.0	29.0
.1	.1	2.9	2.9	5.0	4.9
79.0	79.0	21.5	21.5	15.2	15.1
64	64	73	73	93	95
5.7300	5.1400	3.4634	3.0960	3.1500	3.5500
10.76	12.23	12.80	13.01	11.90	11.78
.45	.02	.21	.01	.38	.25
3077	2950	2864	2577	2853	2698
1364	1150	540	480	490	370
12.43	12.58	13.27	13.31	13.39	13.16
3006.7	2694.3	1595.8	1430.0	1252.1	1408.2
81.1	77.7	66.3	59.8	56.9	53.8
104.4	87.9	36.5	32.5	29.3	21.8
200	200	192	192	171	194
60	60	63	63	63	63
184	184	184	184	184	183
11.0	7.0	10.0	6.0	8.0	5.0
872	792	899	749	815	705

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

10.1	10.2	11.1	11.2	12.1	12.2
3/ 2/77	3/ 2/77	3/ 2/77	3/ 2/77	3/ 9/77	3/ 9/77
746.4	746.4	746.4	746.4	740.3	740.3
53	53	53	53	48	48
77	77	77	77	80	80
1000	1000	1000	1000	1000	1000
57.0	58.0	38.8	38.8	24.0	24.0
10.8	11.0	7.3	7.3	4.6	4.6
6.0	5.9	4.8	4.8	3.7	3.7
36.0	36.0	39.0	39.0	20.0	20.0
8.0	8.0	13.0	13.0	16.5	16.5
10.6	10.6	6.6	6.6	3.8	3.8
106	106	91	91	101	104
3.3400	3.1100	4.0000	4.0740	1.6959	1.4997
11.66	11.78	11.33	11.55	13.42	13.82
.67	.40	.65	.43	.35	.06
2792	2507	2897	2832	2754	2483
399	370	525	623	220	160
13.49	13.43	13.19	13.06	14.04	13.98
1118.9	1018.6	1053.3	1060.3	365.0	315.9
47.0	41.2	38.3	37.0	29.8	26.3
19.9	18.1	20.6	24.2	6.9	4.9
192	192	191	191	193	193
45	45	45	45	45	45
183	183	183	183	184	184
6.0	5.0	5.0	4.0	3.0	3.0
784	655	721	600	740	612

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

13.1	13.2	14.1	14.2	15.1	15.2
3/ 9/77	3/ 9/77	3/ 9/77	3/ 9/77	3/10/77	3/10/77
740.3	740.3	740.3	740.3	734.2	734.2
48	48	48	48	59	59
79	79	79	79	81	81
1000	1000	1000	1000	1500	1500
10.0	10.0	.6	.6	107.0	107.0
1.9	1.9	.1	.1	31.0	31.0
2.7	2.9	2.3	2.4	16.4	16.4
20.0	20.0	20.0	20.0	20.0	20.0
18.1	18.1	19.7	19.7	.3	.3
2.0	2.0	1.1	1.1	79.0	79.0
110	110	117	117	60	60

CONCENTRATIONS, DRY BASIS

.3986	.0022	.2328	.0009	6.5700	6.7300
13.83	14.34	13.65	13.78	10.53	10.68
.93	.57	1.38	1.40	.19	.19
1853	685	1539	70	2871	2775
128	128	62	86	548	550
15.08	15.13	15.51	15.80	11.99	11.98

AIR/FUEL RATIO

EMISSION RATES, G/HR

65.9	.4	34.6	.1	5377.1	5492.3
15.4	6.2	11.5	.5	118.0	113.7
3.1	3.4	1.3	1.9	68.7	68.8

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

190	190	190	190	210	210
45	45	45	45	45	45
185	181	184	184	187	187
4.0	2.0	2.0	1.0	19.0	10.0
713	553	705	555	1081	913

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

16.1	16.2	17.1	17.2	18.1	18.2
3/ 2/77	3/ 2/77	3/ 2/77	3/ 2/77	3/ 2/77	3/ 2/77
742.4	742.4	742.4	742.4	742.4	742.4
58	58	58	58	58	58
81	81	81	83	81	81
1500	1500	1500	1500	1500	1500
98.0	98.0	81.0	81.0	65.0	65.0
28.0	28.0	23.2	23.2	18.6	18.6
13.7	13.7	11.1	11.0	8.9	8.9
23.0	23.0	31.0	31.0	36.0	36.0
3.0	3.0	5.5	5.5	7.5	7.5
30.5	30.5	22.0	22.0	17.0	17.0
67	67	83	83	108	108

CONCENTRATIONS, DRY BASIS

CO, %	4.4750
CO2, %	11.33
O2, %	.52
HC, PPMC	2479
NOX, PPM	570

1.8900	1.7900
12.62	12.88
.65	.38
2487	2137
898	745

AIR/FUEL RATIO

13.44

14.06

EMISSION RATES, G/HR

CO	3279.8
HC	91.2
NOX+	63.7

1950.1
73.7
67.5

919.8
55.2
58.3

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

207	207
50	50
184	184
9.0	9.0
883	883

207	207
50	50
184	184
10.0	10.0
1018	1018

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

19.1	19.2	20.1	20.2	21.1	21.2
3/ 2/77	3/ 2/77	3/ 9/77	3/ 9/77	3/ 2/77	3/ 2/77
742.4	742.4	740.3	740.3	742.4	742.4
58	58	48	48	58	58
72	72	80	80	72	72
1500	1500	1500	1500	1500	1500
43.0	43.6	27.3	27.3	10.9	10.9
12.2	12.4	7.8	7.8	3.1	3.1
6.6	6.5	5.3	5.4	3.9	3.9
44.0	44.0	42.0	42.0	30.0	30.0
12.0	12.0	17.3	17.3	19.8	19.8
10.5	10.5	7.5	7.5	4.7	4.7
135	135	91	91	94	94

CONCENTRATIONS, DRY BASIS

CO, %	1.2800	1.2423	.9678	1.1600	.8649
CO2, %	13.14	13.63	13.81	13.14	13.40
O2, %	.40	.38	.09	.70	.43
HC, PPMC	1702	2610	1631	2238	1314
NOX, PPM	350	1647	1252	173	135

AIR/FUEL RATIO

14.44	14.33	14.31	14.32	14.53	14.57
-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	492.3	388.9	306.3	266.6	199.2
HC	32.9	41.0	25.9	25.8	15.2
NOX+	20.5	75.4	57.9	6.1	4.7

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

204	204	197	197	197	197
50	50	50	50	50	50
182	183	187	187	180	180
6.0	5.0	5.0	4.0	4.0	3.0
915	814	855	710	831	647

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

22.1	23.1	23.2	24.1	24.2
3/28/77	3/ 9/77	3/10/77	3/ 2/77	3/ 2/77
740.3	734.2	734.2	742.4	742.4
48	57	57	58	58
80	82	82	72	72
1500	2000	2000	2000	2000
.5	113.0	113.0	101.0	101.0
.1	43.6	43.6	38.2	38.2
3.6	20.7	20.8	17.3	17.3
20.0	20.0	20.0	25.0	25.0
20.8	.4	.4	3.0	3.0
4.5	79.0	79.0	36.5	36.5
101	63	63	64	64

4.2033	4.6760	2.6300	2.7200
12.04	11.86	12.38	12.26
.33	.08	.55	.32
2591	2138	2137	1816
1336	1161	1295	1150

13.05	12.76	13.83	13.66
-------	-------	-------	-------

4676.6	5119.1	2583.6	2652.3
144.8	117.5	105.4	88.9
225.1	192.5	193.9	170.9

218	218	212	212
47	47	50	50
189	189	187	187
38.0	18.0	28.0	18.0
1263	1092	1246	1056

.6501	.0059	4.2033	4.6760
13.81	14.46	12.04	11.86
.58	.29	.33	.08
9016	77	2591	2138
879	136	1336	1161

14.06	15.00	13.05	12.76
-------	-------	-------	-------

133.7	1.3	4676.6	5119.1
93.1	.8	144.8	117.5
26.4	4.3	225.1	192.5

199	199	218	218
45	45	47	50
183	183	189	187
2.0	3.0	38.0	18.0
839	645	1263	1092

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

25.1	25.2	26.1	26.2	27.1	27.2
3/29/77	3/29/77	3/ 2/77	3/ 2/77	3/ 2/77	3/ 2/77
734.1	734.1	742.4	742.4	742.4	742.4
50	50	58	58	58	58
82	82	77	77	77	77
2000	2000	2000	2000	2000	2000
84.7	84.7	67.8	67.8	45.2	45.2
32.7	32.7	25.8	25.8	17.2	17.2
14.7	14.0	11.8	11.8	8.9	8.9
32.0	32.0	38.0	38.0	44.0	44.0
6.0	6.0	8.0	8.0	11.5	11.5
.0	.0	21.6	21.6	15.6	15.6
84	85	97	97	121	121

CONCENTRATIONS, DRY BASIS

1.8600	1.7900	.9637	.5840	.5422	.0073
CO, %	CO, %	CO, %	CO, %	CO, %	CO, %
13.40	13.53	13.14	13.53	13.01	13.67
O2, %	O2, %	O2, %	O2, %	O2, %	O2, %
.20	.05	.81	.50	1.28	.83
HC, PPMC	1623	2190	303	2273	60
NOX, PPM	1662	1848	640	950	540

AIR/FUEL RATIO

13.99	13.96	14.76	14.88	15.25	15.42
-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

1565.3	1428.2	686.8	416.6	302.4	4.1
CO	CO	CO	CO	CO	CO
86.2	65.0	78.4	10.9	63.7	1.7
HC	HC	HC	HC	HC	HC
206.4	188.4	200.7	69.9	80.7	46.2
NOX+	NOX+	NOX+	NOX+	NOX+	NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

218	218	217	217	215	215
46	46	50	50	50	50
187	187	184	184	183	183
19.0	15.0	16.0	10.0	11.0	8.0
1169	1010	1137	995	1070	968

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

28.1	28.2	29.1	29.2	30.1	30.2
3/28/77	3/28/77	3/28/77	3/28/77	3/ 3/77	3/ 3/77
740.3	740.3	740.3	740.3	736.2	736.2
48	48	48	48	47	47
81	81	81	81	78	78
2000	2000	2000	2000	2000	2000
28.0	28.2	11.3	11.3	.0	.0
10.7	10.8	4.3	4.3	.0	.0
7.3	7.3	5.2	5.2	4.2	4.2
43.0	43.0	42.0	42.0	34.0	34.0
14.4	14.4	20.2	20.2	21.8	21.8
11.7	11.7	7.0	7.0	5.0	5.0
150	150	103	103	100	100

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

.3327	.0169	.5593	.1225	1.0140	.8324
13.76	14.27	13.74	14.31	13.40	13.80
.94	.39	.72	.23	.32	.05
1860	72	1899	89	1772	573
200	200	847	397	105	70

AIR/FUEL RATIO

15.12	15.07	14.88	14.92	14.39	14.41
-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO

HC

NOX+

150.1	7.6	176.2	38.6	248.9	204.1
42.2	1.6	30.0	1.4	21.8	7.1
13.2	13.2	39.0	18.3	3.7	2.5

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

210	210	209	209	203	203
48	48	48	48	50	3
188	188	184	184	183	183
8.0	6.0	4.0	3.0	3.0	3.0
1035	904	860	694	927	723

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

31.1	31.2	32.1	32.2	33.1	33.2
3/28/77	3/28/77	3/ 3/77	3/ 3/77	3/ 3/77	3/ 3/77
740.3	740.3	736.1	736.2	736.2	736.2
48	48	43	43	41	41
80	80	82	83	83	83
2500	2500	2500	2500	2500	2500
4	4	116.0	116.0	104.0	104.0
2	2	55.6	55.7	49.9	49.9
4.8	4.8	25.8	25.9	22.2	22.2
45.0	45.0	23.0	23.0	23.0	23.0
22.2	22.2	.6	.6	2.4	2.4
7.0	7.0	79.0	79.0	47.0	47.0
98	98	65	65	64	64

CONCENTRATIONS, DRY BASIS

CO, %	3.7200	3.9000	2.0300	1.9300
CO2, %	12.13	12.25	13.13	13.53
O2, %	.25	.10	.40	.10
HC, PPMC	2379	1063	1950	437
NOX, PPM	1975	1975	2175	1325

AIR/FUEL RATIO

14.94	13.22	13.18	14.06	14.04
-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	5217.1	5469.9	2590.0	2451.7
HC	167.6	74.9	124.9	27.9
NOX+	395.8	395.8	393.8	238.9

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

213	235	235	232	232
50	50	50	52	52
186	188	188	188	188
4.0	66.0	31.0	57.0	27.0
792	1401	1212	1391	1225

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

34.1	34.2	35.1	35.2	36.1	36.2
3/ 3/77	3/ 3/77	3/ 3/77	3/ 3/77	3/ 3/77	3/ 3/77
736.2	736.2	736.2	736.2	736.2	736.2
43	43	43	43	41	41
83	83	82	82	81	81
2500	2500	2500	2500	2500	2500
87.0	87.0	69.0	69.0	46.0	46.0
41.8	41.8	33.1	33.1	22.0	22.0
18.6	18.6	15.1	15.0	11.1	11.1
33.0	33.0	41.0	41.0	46.0	46.0
5.0	5.0	7.9	7.9	12.2	12.2
34.0	34.0	26.0	26.0	19.0	19.0
78	78	92	92	116	116

CONCENTRATIONS, DRY BASIS

CO, %	1.7900	.0584	.3600	.0112
CO2, %	13.40	13.66	14.07	14.63
O2, %	.40	.15	.85	.40
HC, PPMC	2182	1075	222	73
NOX, PPM	2175	1912	2600	1900

AIR/FUEL RATIO

14.15	14.33	15.02	15.06	15.12
-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	1924.0	1306.9	681.5	53.3	7.6
HC	117.8	58.8	10.3	3.3	3.1
NOX+	334.0	297.5	382.6	338.9	164.4

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

234	234	230	226	224
52	52	52	50	50
187	187	186	185	186
40.0	20.0	30.0	17.0	9.0
1289	1116	1232	1127	974

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

37.1	37.2	38.1	38.2	39.1	39.2
3/ 3/77	3/ 3/77	3/ 3/77	3/ 3/77	3/ 3/77	3/ 3/77
736.2	736.2	736.2	736.2	736.2	736.2
41	41	41	41	41	41
80	80	80	80	80	80
2500	2500	2500	2500	2500	2500
29.0	29.0	11.6	11.6	0	1
13.9	13.9	5.6	5.6	0	0
8.6	8.6	6.5	6.5	4.7	4.8
46.0	46.0	46.0	46.0	46.0	46.0
15.0	15.0	18.5	18.5	21.6	21.6
14.5	14.1	9.9	9.9	6.8	6.8
135	135	133	133	103	98

CONCENTRATIONS, DRY BASIS

CO, %	1.1200	1.0700	.8419	.2875
CO2, %	13.93	13.67	13.53	14.21
O2, %	1.11	.73	1.37	.85
HC, PPMC	2265	734	1372	65
NOX, PPM	171	61	275	138

AIR/FUEL RATIO

15.10	14.83	14.74	15.22	15.25
-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	311.1	38.8	419.8	85.5
HC	59.6	1.8	14.5	1.0
NOX+	41.6	12.0	3.4	5.8

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

217	217	215	213	212
55	55	54	54	54
186	186	182	182	181
10.0	7.0	6.0	5.0	4.0
1087	921	1039	972	793

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

40.1	40.2	41.1	41.2	42.1	42.2
3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77
742.0	742.0	742.0	742.0	742.0	742.0
39	39	43	41	38	38
80	80	82	82	83	83
3000	3000	3000	3000	3000	3000
118.0	118.0	106.0	106.0	89.0	89.0
67.2	67.2	60.5	60.5	50.8	50.8
31.7	30.4	27.3	27.3	22.0	22.0
26.0	26.0	25.0	25.0	35.0	35.0
.8	.8	2.4	2.4	5.1	5.1
79.5	79.5	53.0	53.0	38.0	38.0
62	62	63	63	78	78

CONCENTRATIONS, DRY BASIS

4.1800	4.0900	2.2700	2.4000	1.0600	.7625
12.13	12.25	13.66	14.00	14.35	14.63
.20	.05	.60	.10	.55	.10
2456	1466	1962	301	1759	208
1562	1425	1950	1025	2850	1675

AIR/FUEL RATIO

13.01	13.04	14.11	13.89	14.63	14.58
-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

7091.6	6652.1	3564.1	3700.2	1387.8	994.5
209.2	119.8	154.7	23.3	115.7	13.6
372.8	326.0	437.9	224.5	523.1	306.2

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

218	218	240	240	242	242
55	55	53	53	53	55
190	190	189	189	188	188
81.0	40.0	84.0	39.0	60.0	28.0
1430	1194	1475	1317	1370	1227

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

43.1	43.2	44.1	44.2	45.1	45.2
3/ 4/77	3/ 4/77	3/28/77	3/28/77	3/ 4/77	3/ 4/77
742.0	742.0	722.0	722.0	742.0	742.0
38	38	64	62	38	38
83	83	85	85	80	80
3000	3000	3000	3000	3000	3000
71.0	71.0	47.0	47.0	30.0	30.0
40.5	40.5	27.8	27.8	17.1	17.1
18.3	18.2	13.5	13.5	10.9	10.9
43.0	43.0	47.0	47.0	49.0	49.0
7.7	7.8	12.3	12.3	15.1	15.1
31.0	31.0	23.0	23.0	18.0	18.0
92	92	103	86	120	120

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

.2875	.0112	.1253	.0112	.2625	.0112
14.35	14.77	14.35	14.63	14.07	14.63
.73	.48	1.00	.75	1.15	.75
1621	40	1663	63	1775	230
3400	3400	2000	2000	1000	1000

AIR/FUEL RATIO

15.12	15.24	15.33	15.37	15.32	15.32
-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO

HC

NOX+

323.4	12.6	105.6	9.4	178.3	7.6
91.6	2.3	70.4	2.7	60.5	7.8
536.1	537.2	263.5	260.8	95.2	94.8

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

241	241	233	233	230	230
53	53	53	53	55	55
186	186	186	187	184	184
44.0	21.0	26.0	13.0	17.0	9.0
1328	1137	1208	1010	1177	977

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

46.1	46.2	47.1	47.2	48.1	48.2
3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77
742.0	742.0	741.5	741.5	741.5	741.5
41	41	41	41	41	41
80	80	80	80	81	81
3000	3000	3000	3000	3500	3500
12.0	12.0	.0	.0	.0	.0
6.8	6.8	.0	.0	.0	.0
8.1	8.1	7.0	6.9	8.1	8.1
48.0	48.0	48.0	48.0	51.0	51.0
18.5	18.5	19.5	19.5	19.6	19.6
13.0	13.0	11.0	11.0	13.5	13.5
146	146	19	162	147	147

.0112	.0787	.7218	.0231
14.91	15.06	14.19	15.21
.50	.15	1.10	.45
288	202	1418	370
190	43	48	60
15.11	14.86	15.08	15.06

5.6	32.7	359.6	11.4
7.2	4.2	35.5	9.2
13.5	2.5	3.4	4.2
223	220	231	231
55	55	58	55
186	183	185	185
6.0	5.0	10.0	7.0
947	966	1238	1020

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

49.1

3/ 4/77

742.0

41

86

3500

117.5

78.6

37.2

28.0

1.0

77.0

67

49.2

3/ 4/77

742.0

36

87

3500

117.0

78.2

36.8

28.0

1.0

77.0

68

50.1

3/ 4/77

742.0

40

85

3500

105.0

70.1

31.2

28.0

2.0

61.1

58

50.2

3/ 4/77

742.0

40

85

3500

105.0

70.1

31.5

28.0

2.0

61.2

58

51.1

3/ 4/77

742.0

40

85

3500

87.7

58.6

25.8

38.0

5.0

43.5

75

51.2

3/ 4/77

742.0

40

85

3500

87.7

58.6

25.8

38.0

5.0

43.5

75

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

4.3860

11.80

.49

2239

1344

4.6188

11.74

.37

1345

1075

1.3283

13.17

1.42

1208

2490

.1272

14.54

.74

12

1011

.7584

13.58

1.17

1547

2949

.0450

14.50

.60

23

2551

AIR/FUEL RATIO

13.09

13.00

15.12

15.28

15.20

15.28

EMISSION RATES, G/HR

CO

HC

NOX+

8793.2

225.4

382.7

9103.9

133.2

295.1

2559.4

116.9

679.3

240.9

1.2

280.1

1214.8

124.4

669.0

72.3

1.8

580.2

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

247

55

189

100.0

1490

254

55

188

60.0

1280

250

55

190

104.0

1652

250

55

190

62.0

1490

253

55

187

70.0

1442

253

55

188

40.0

1370

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

52.2	53.1	53.2	54.1	54.2
3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77
742.0	742.0	742.0	742.0	742.0
40	40	40	40	40
85	84	84	83	83
3500	3500	3500	3500	3500
70.0	46.8	46.8	29.0	29.0
46.7	31.2	31.2	19.3	19.3
22.9	15.8	16.1	12.7	12.9
41.0	48.0	48.0	50.0	50.0
6.5	12.0	12.0	15.0	15.0
37.8	26.5	26.5	21.1	21.1
85	101	101	114	114

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

.2485	.1007	.0900	.1611	.1125
13.79	13.31	13.57	13.67	13.95
1.31	2.12	1.91	1.71	1.47
1312	1286	48	1300	50
3354	2274	2289	1020	950

AIR/FUEL RATIO

15.58	16.24	16.22	15.84	15.81
-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO

HC

NOX+

363.0	106.2	95.9	132.0	93.9
96.3	68.1	2.6	53.5	2.1
693.7	339.6	345.4	118.3	112.3

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

250	244	244	238	238
55	55	55	55	55
186	185	185	184	184
55.0	31.0	19.0	21.0	133.0
1415	1307	1124	1246	1062

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

55.1	55.2	56.1	56.2	57.1	57.2
3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77
742.0	742.0	744.5	744.5	744.5	744.5
40	40	47	47	47	47
82	82	85	86	88	88
3500	3500	4300	4300	4300	4300
11.7	11.7	112.0	112.0	100.0	100.0
7.8	7.8	91.7	91.8	82.1	82.1
9.5	9.6	45.3	45.3	39.7	40.0
50.0	50.0	27.0	27.0	28.0	28.0
18.5	18.5	1.5	1.5	2.0	2.0
15.8	15.8	77.8	77.8	64.4	64.4
135	135	63	64	58	58

CONCENTRATIONS, DRY BASIS

CO, %	4.0110	4.2253	2.0702	.9786
CO2, %	12.12	12.10	13.00	14.27
O2, %	.10	.10	.56	.02
HC, PPMC	1812	1034	844	20
NOX, PPM	1325	615	2302	450

AIR/FUEL RATIO

15.29	13.05	14.24	14.41
-------	-------	-------	-------

EMISSION RATES, G/HR

CO	9751.8	10234.9	4791.6	2297.0
HC	221.2	125.7	98.1	2.4
NOX+	468.7	216.9	775.3	153.6

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

233	245	272	272
55	60	55	55
183	189	188	188
15.0	140.0	145.0	84.0
1266	1645	1660	1539

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	58.1	58.2	59.1	59.2	60.1	60.2
TEST DATE	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77
BAROMETER, MMHG	744.5	744.5	744.5	744.5	744.5	744.5
HUMIDITY, GRAINS/LB	47	47	47	47	47	47
TEMPERATURE, F	86	86	85	85	84	84
ENGINE SPEED, RPM	4300	4300	4300	4300	4300	4300
TORQUE, FT-LB	84.0	84.0	67.0	67.0	44.8	44.8
POWER, BHP*	68.9	68.9	54.9	54.9	36.7	36.7
FUEL RATE, LB/HR	32.6	32.2	26.3	26.3	20.3	20.3
IGNITION TIMING, DEG BTDC	39.0	39.0	46.0	46.0	51.0	51.0
MANIFOLD VACUUM, IN HG	4.5	4.5	7.5	7.5	11.4	11.4
THROTTLE ANGLE, DEG	51.1	51.1	40.0	40.8	32.4	32.4
INTAKE MAN. TEMP., F	72	72	81	81	91	91

CONCENTRATIONS, DRY BASIS

CO, %	1.1889	.0665	.2311	.0045	.1309	.0036
CO2, %	13.48	14.84	13.71	14.03	13.14	13.42
O2, %	.71	.10	1.27	1.04	2.14	2.01
HC, PPMC	1125	18	942	37	736	33
NOX, PPM	2685	1095	3244	3394	2185	2281

AIR/FUEL RATIO

	14.73	14.88	15.61	15.65	16.32	16.36
--	-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	2337.2	129.8	388.3	7.6	177.7	4.8
HC	111.1	1.7	79.5	3.1	50.1	2.3
NOX+	768.0	310.9	793.2	829.0	431.6	450.9

OIL TEMPERATURE, F

	270	270	265	265	259	259
--	-----	-----	-----	-----	-----	-----

OIL PRESSURE, PSI

	55	55	55	55	55	55
--	----	----	----	----	----	----

COOLANT TEMPERATURE, F

	187	187	185	185	185	185
--	-----	-----	-----	-----	-----	-----

EXHAUST PRESSURE, IN. H2O

	104.0	60.0	72.0	40.0	49.0	26.0
--	-------	------	------	------	------	------

EXHAUST TEMPERATURE, F

	1613	1483	1487	1312	1416	1210
--	------	------	------	------	------	------

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO₂, %

O₂, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H₂O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

61.1	61.2	62.1	62.2	63.1	63.2
3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77
744.5	744.5	744.5	744.5	744.5	744.5
47	47	47	47	47	47
83	83	82	82	82	82
4300	4300	4300	4300	4300	4300
28.0	28.0	11.2	11.2	2.3	2.3
22.9	22.9	9.1	9.1	1.9	1.9
15.6	15.6	12.6	12.6	11.2	11.0
52.0	52.0	53.0	53.0	53.0	53.0
15.0	15.0	17.5	17.5	19.0	19.0
25.1	25.1	20.2	20.2	17.8	17.8
105	105	120	120	130	130
.1521	.0028	.2341	.0054	.3184	.0074
13.64	13.92	14.04	14.40	14.08	14.60
1.54	1.34	.98	.73	.90	.41
800	32	2999	40	2379	39
1185	1179	439	793	251	661
15.78	15.79	15.08	15.33	15.04	15.10
153.1	2.8	181.2	4.3	218.5	5.0
40.4	1.6	116.6	1.6	82.0	1.3
173.5	172.5	49.5	90.6	25.1	64.8
253	253	247	247	246	246
57	57	58	58	59	59
184	184	183	183	183	183
30.0	16.0	21.0	11.0	19.0	10.0
1356	1148	1377	1127	1391	1140

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

64.1	64.2	65.1	65.2	66.1	66.2
3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77
744.5	744.5	744.5	744.5	744.5	744.5
47	47	46	46	46	46
84	84	89	89	89	89
5000	5000	5000	5000	5000	5000
102.0	102.0	91.8	91.8	76.5	76.5
97.0	97.0	87.7	87.7	73.1	73.1
50.0	50.0	44.2	44.4	37.4	37.3
34.0	34.0	34.0	34.0	37.0	37.0
1.0	1.0	2.4	2.4	4.0	4.0
77.8	77.8	64.7	64.7	55.6	55.6
61	61	59	59	70	70

CONCENTRATIONS, DRY BASIS

CO, %	4.0235	4.0769	2.0969	.8896	1.2228	.0340
CO2, %	12.14	12.21	12.98	14.31	13.36	14.62
O2, %	.00	.00	.60	.00	.88	.25
HC, PPMC	1867	980	815	16	781	9
NOX, PPM	777	135	2466	767	2788	1721

AIR/FUEL RATIO

12.97	13.01	14.27	14.45	14.86	15.02
-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	10721.6	10899.5	5422.6	2321.3	2779.6	77.6
HC	249.8	131.5	105.8	2.1	89.2	1.0
NOX+	301.4	52.4	924.1	289.9	918.4	569.3

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

266	266	281	284	284	284
55	55	55	55	55	55
190	190	191	191	188	188
151.0	110.0	151.0	104.0	136.0	78.0
1660	1417	1665	1592	1660	1554

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

67.1	67.2	68.1	68.2	69.1	69.2
3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77
744.5	744.5	744.5	744.5	744.5	744.5
46	46	46	46	46	46
88	88	86	86	84	84
5000	5000	5000	5000	5000	5000
61.2	61.2	40.8	40.8	25.5	25.5
58.4	58.4	38.9	38.9	24.3	24.3
31.9	31.5	23.5	23.5	19.0	19.0
46.0	46.0	55.0	55.0	55.0	54.0
7.0	7.0	11.0	11.0	14.5	14.5
47.3	47.3	36.5	36.5	29.6	29.6
78	78	86	86	92	92

CONCENTRATIONS, DRY BASIS

CO, %

CO₂, %O₂, %

HC, PPMC

NOX, PPM

.6036	.0035	.1411	.0029	.1498	.0042
13.61	14.12	12.87	13.03	13.27	13.47
1.05	.89	2.42	2.36	1.96	1.82
857	23	460	20	958	28
3528	3589	2616	2577	1372	1364

AIR/FUEL RATIO

15.28	13.55	16.60	16.68	16.11	16.18
-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO

HC

NOX+

1202.7	7.0	226.1	4.7	187.5	5.3
85.8	2.3	37.0	1.6	60.2	1.8
1018.8	1041.2	607.5	600.8	248.9	248.3

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H₂O

EXHAUST TEMPERATURE, F

283	283	277	277	268	268
55	55	57	57	57	55
188	188	186	186	185	185
101.0	56.0	65.0	35.0	44.0	22.0
1651	1432	1485	1274	1452	1226

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

70.1	70.2	71.1	71.2	72.1	72.2
3/ 4/77	3/ 4/77	3/ 4/77	3/ 4/77	3/ 7/77	3/ 7/77
744.5	744.5	744.5	744.5	742.0	742.0
46	46	46	46	46	46
84	84	86	84	79	79
5000	5000	5000	5000	750	750
10.2	10.2	2.8	2.8	.2	.2
9.7	9.7	2.7	2.7	.0	.0
14.8	14.8	13.9	13.7	1.8	1.8
55.0	55.0	55.0	55.0	20.0	20.0
17.5	17.5	18.3	18.3	18.0	18.0
23.5	23.5	21.9	21.9	.0	.0
110	110	118	118	122	122

CONCENTRATIONS, DRY BASIS

CO, %	.2204	.2604	.0037	.1709	.0010
CO2, %	13.90	14.05	14.57	11.43	12.65
O2, %	1.11	.88	.35	4.49	2.79
HC, PPMC	1651	2617	37	8674	180
NOX, PPM	577	434	442	21	40

AIR/FUEL RATIO

15.32	15.04	15.06	17.22	16.96
-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	203.7	222.6	3.1	22.5	.1
HC	76.6	112.3	1.6	57.3	1.2
NOX+	77.3	53.7	54.0	.4	.8

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

264	264	264	184	184
58	58	27	41	41
186	186	187	179	179
29.0	26.0	11.0	4.0	.0
1457	1474	1258	628	677

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

73.1	73.2	74.1	74.2	75.1	75.2
3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77	3/28/77	3/28/77
742.0	742.0	742.0	742.0	722.0	722.0
45	46	46	46	64	64
79	79	79	79	82	82
650	650	1000	1000	1000	1000
8.4	8.4	73.0	73.0	39.0	39.0
1.0	1.0	13.9	13.9	7.7	7.7
1.8	1.9	7.2	7.3	4.8	4.9
20.0	20.0	31.0	31.0	40.0	40.0
16.0	16.0	6.0	6.0	13.0	13.0
.0	.0	15.1	15.1	.0	.0
121	121	100	100	91	91

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPN

.1324	.0025	3.8931	3.8358	3.3040	3.1500
12.59	13.00	12.14	12.34	12.50	12.88
2.72	2.28	.01	.25	.25	.00
3604	227	2620	2490	2928	2820
43	57	313	339	975	875

AIR/FUEL RATIO

16.38	16.51	12.94	13.14	13.32	13.27
-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO

HC

NOX*

16.4	3	1503.6	1511.5	871.0	834.6
22.5	1.5	50.8	49.3	38.8	37.5
.8	1.1	17.6	19.4	40.2	36.2

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

182	182	194	194	189	189
40	40	41	41	45	45
181	181	185	185	187	187
4.0	.0	9.0	5.0	3.0	4.0
603	631	827	738	789	683

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

76.1	76.2	77.1	77.2	78.1	78.2
3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77
742.0	742.0	742.0	742.0	742.0	742.0
46	46	46	46	46	46
79	79	79	80	79	80
1000	1000	1000	1000	1000	1000
24.0	24.0	10.0	10.0	.8	.8
4.6	4.6	1.9	1.9	.2	.2
3.5	3.5	2.6	2.7	2.3	2.4
20.0	20.0	20.0	20.0	20.0	20.0
16.5	16.5	19.0	19.0	19.5	19.5
3.8	3.8	2.0	2.0	1.1	1.1
101	101	111	111	115	115
1.0725	.9512	.2901	.0013	.2549	.0030
13.81	14.15	13.78	14.14	13.61	13.82
.52	.07	1.37	1.11	1.71	1.51
2260	947	1730	126	2222	120
262	160	86	79	48	47
14.46	14.35	15.44	15.57	15.65	15.87
222.6	195.5	47.0	.2	37.3	.5
23.6	9.8	14.1	1.1	16.3	.9
7.9	4.8	2.0	2.0	1.0	1.1
193	193	190	190	188	188
41	42	41	41	44	44
182	182	183	183	182	182
5.0	3.0	4.0	.0	4.0	.0
722	656	707	604	715	575

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

79.1	79.2	80.1	80.2	81.1	81.2
3/29/77	3/29/77	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77
734.1	734.1	742.0	742.0	742.0	742.0
50	50	46	46	46	46
80	80	81	80	80	80
1500	1500	1500	1500	1500	1500
81.7	81.7	43.6	43.6	27.3	27.3
23.6	23.6	12.4	12.4	7.8	7.8
11.0	11.0	6.7	6.7	5.4	5.4
32.0	32.0	44.0	44.0	44.0	44.0
6.0	6.0	12.2	12.2	17.5	17.5
.0	.0	10.5	10.5	7.5	7.5
82	82	135	135	95	95
2.7200	2.8500	1.4584	.8970	1.2037	.7963
12.87	12.87	13.56	14.28	13.82	14.39
.15	.05	.57	.08	.51	.12
2154	1983	2646	339	2602	739
913	825	549	156	1905	1500
13.56	13.47	14.30	14.45	14.42	14.52
1662.2	1732.0	570.5	353.3	379.3	252.0
66.1	60.5	52.0	6.7	41.2	11.7
82.3	74.0	31.1	8.9	87.1	68.8
203	204	204	204	203	203
44	44	46	46	46	46
187	187	184	184	184	184
9.0	6.0	7.0	5.0	6.0	4.0
1015	898	891	840	848	775

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	82.1	82.2	83.1	83.2	84.1	84.2
TEST DATE	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77
BAROMETER, MMHG	742.0	742.0	742.0	742.0	742.0	742.0
HUMIDITY, GRAINS/LB	46	46	46	46	46	46
TEMPERATURE, F	80	80	80	80	86	81
ENGINE SPEED, RPM	1500	1500	1500	1500	2000	2000
TORQUE, FT-LB	10.9	10.9	1.0	1.0	84.7	84.7
POWER, BHP*	3.1	3.1	.3	.3	32.4	32.2
FUEL RATE, LB/HR	3.8	3.8	3.5	3.5	14.2	14.2
IGNITION TIMING, DEG BTDC	31.0	31.0	22.0	22.0	36.0	36.0
MANIFOLD VACUUM, IN HG	20.0	20.0	20.8	20.8	6.0	6.0
THROTTLE ANGLE, DEG	4.7	4.7	4.5	4.5	27.7	27.7
INTAKE MAN. TEMP., F	100	100	102	102	80	80

CONCENTRATIONS, DRY BASIS

CO, %	.4022	.0030	.5657	.0018	1.2683	1.1457
CO2, %	14.06	14.43	14.10	14.63	13.48	13.89
O2, %	.84	.68	.79	.60	.41	.07
HC, PPMC	1612	117	1657	93	2281	296
NOX, PPM	222	211	90	82	2298	1194
AIR/FUEL RATIO	15.04	15.27	14.92	15.21	14.37	14.36

EMISSION RATES, G/HR

CO	93.6	.7	120.9	.4	1063.0	957.1
HC	18.8	1.4	17.8	1.0	96.0	12.4
NOX+	7.5	7.2	2.8	2.6	279.4	144.7

OIL TEMPERATURE, F	199	199	198	198	193	193
OIL PRESSURE, PSI	45	45	46	46	50	50
COOLANT TEMPERATURE, F	184	184	184	184	184	184
EXHAUST PRESSURE, IN. H2O	5.0	4.0	5.0	2.0	20.0	11.0
EXHAUST TEMPERATURE, F	841	713	873	703	1141	1064

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

85.1
3/ 7/77
742.0
46
81
2000
45.2
17.2
8.9
46.0
12.0
15.6
129

85.2
3/ 7/77
742.0
46
81
2000
45.2
17.2
9.0
46.0
12.0
15.6
129

86.1
3/ 7/77
742.0
46
81
2000
28.3
10.8
7.2
46.0
15.0
11.7
151

86.2
3/ 7/77
742.0
46
81
2000
28.3
10.8
7.3
46.0
15.0
11.7
151

87.1
3/ 7/77
742.0
46
81
2000
11.3
4.3
5.0
46.0
21.0
7.0
97

87.2
3/ 7/77
742.0
46
81
2000
11.3
4.3
4.9
46.0
21.0
7.0
97

CONCENTRATIONS, DRY BASIS

CO, %
17.04
13.66
O2, %
1.12
HC, PPMC
2269
NOX, PPM
1209

.0031
14.06
.80
66
480

.4727
13.72
.88
2731
302

.0186
14.39
.37
72
207

.5332
13.83
.72
1469
781

.1364
14.49
.21
99
368

AIR/FUEL RATIO

15.32

15.38

14.93

15.05

14.93

14.90

EMISSION RATES, G/HR

CO
95.7
HC
64.0
NOX+
98.5

1.7
1.9
39.4

206.7
60.0
19.1

8.3
1.6
13.4

161.8
22.4
34.4

40.7
1.5
15.9

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

215
50
185
11.0
1054

215
50
185
6.0
944

214
50
184
9.0
1029

214
50
184
5.0
933

209
50
184
6.0
902

209
50
184
4.0
798

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

88.1	88.2	89.1	89.2	90.1	90.2
3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77
742.0	742.0	742.0	742.0	742.0	742.0
46	46	46	46	46	46
81	81	75	83	83	83
2000	2000	2500	2500	2500	2500
.8	.8	87.0	87.0	46.0	46.0
.3	.3	41.2	41.5	21.9	21.9
4.1	4.2	18.4	18.4	11.7	11.8
36.0	36.0	36.0	36.0	46.0	46.0
22.0	22.0	5.5	5.5	12.0	12.0
5.0	5.0	34.0	34.0	19.0	19.0
100	100	75	75	113	113

CONCENTRATIONS, DRY BASIS

CO, %	1.1823	1.0000	.1640	.0031
CO2, %	13.41	14.48	13.74	14.10
O2, %	.65	.04	1.09	.80
HC, PPMC	1795	439	1930	47
NOX, PPM	2659	2200	2232	2075

AIR/FUEL RATIO

14.89	14.91	14.62	14.44	15.37	15.44
-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	126.8	47.2	1305.0	1081.4	121.1	2.3
HC	17.2	1.0	99.5	23.8	71.6	1.8
NOX+	5.9	3.8	425.8	345.1	239.1	223.9

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

208	208	229	229	230	230
50	50	50	50	50	50
184	184	187	187	185	185
5.0	3.0	34.0	20.0	17.0	10.0
931	778	1270	1230	1159	1060

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

91.1	91.2	92.1	92.2	93.1	93.2
3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77
742.0	742.0	742.0	742.0	742.0	742.0
46	46	46	46	46	46
82	82	80	82	81	81
2500	2500	2500	2500	2500	2500
29.0	29.0	11.6	11.6	1.0	1.0
13.8	13.8	5.5	5.5	5	5
9.0	9.0	6.6	6.6	5.0	5.0
48.0	48.0	48.0	48.0	46.0	46.0
15.4	15.4	19.0	19.0	22.0	22.0
14.4	14.4	9.5	9.5	9.9	9.9
135	135	132	132	97	97

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

.3101	.0239	1.0360	.7648	1.5669	.6656
13.83	14.35	13.68	14.20	13.45	14.31
.92	.46	.56	.03	.44	.04
2099	48	2382	140	2185	159
700	603	186	61	245	106
15.11	15.13	14.49	14.48	14.20	14.53

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

173.3	13.3	404.2	299.8	457.2	197.9
58.9	1.4	46.7	2.7	32.0	2.4
56.7	48.9	10.5	3.4	10.4	4.6

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

224	224	219	219	215	215
50	50	50	50	50	50
184	184	183	183	183	183
11.0	6.0	9.0	5.0	6.0	4.0
1105	988	1045	904	966	841

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

94.1	94.2	95.1	95.2	96.1	96.2
3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77	3/ 7/77
742.0	742.0	742.0	742.0	742.0	742.0
46	46	46	46	46	46
83	83	84	84	83	83
3000	3000	3000	3000	3000	3000
89.0	89.0	47.0	47.0	30.0	30.0
50.9	50.9	26.9	26.9	17.2	17.2
22.2	22.2	13.8	13.8	11.0	11.0
38.0	38.0	48.0	48.0	48.0	48.0
5.2	5.2	12.4	12.4	15.2	15.2
38.0	38.0	23.0	23.0	18.0	18.0
70	72	104	104	109	109

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

.7303	.0091	.1249	.0024	.1754	.0021
13.44	14.43	13.49	13.79	13.71	14.06
.92	.35	1.47	1.21	1.18	.86
1392	31	1670	42	1751	53
2933	2030	2433	2504	1212	1274

AIR/FUEL RATIO

15.06	15.11	15.71	15.75	15.41	15.45
-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO

HC

NOX+

998.3	12.5	110.6	2.2	121.9	1.4
95.6	2.2	74.3	1.9	61.1	1.8
581.6	403.1	312.6	323.5	122.2	127.8

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

208	228	238	238	235	235
54	54	54	54	54	54
190	190	186	186	185	185
46.0	25.0	22.0	12.0	15.0	9.0
1347	1288	1222	1120	1177	1050

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

97.1	98.1	98.2	99.1	99.2
3/ 7/77	3/ 7/77	3/ 7/77	3/ 8/77	3/ 8/77
742.0	742.0	742.0	745.7	745.7
46	46	46	48	48
82	82	82	86	86
3000	3000	3000	3500	3500
12.0	1.9	1.9	88.0	88.0
6.9	1.1	1.1	58.6	58.6
8.7	7.0	7.0	26.4	26.4
48.0	50.0	50.0	37.0	37.0
18.0	19.5	19.5	4.6	4.6
13.0	11.0	11.0	43.5	43.5
135	163	163	70	70

.5870	.8136	.0127
13.49	13.53	14.58
1.15	.85	.24
3380	605	20
123	3150	2099
14.98	15.06	15.04

253.8	1321.0	20.4
73.4	49.3	1.6
7.7	745.9	493.8

226	256	256
52	52	52
185	190	190
10.0	78.0	35.0
1167	1435	1350

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	100.1	100.2	101.1	101.2	102.1	102.2
TEST DATE	3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77
BAROMETER, MMHG	745.7	745.7	745.7	745.7	745.7	745.7
HUMIDITY, GRAINS/LB	43	46	48	48	41	41
TEMPERATURE, F	85	85	84	84	84	84
ENGINE SPEED, RPM	3500	3500	3500	3500	3500	3500
TORQUE, FT-LB	47.0	47.0	29.0	29.0	11.7	11.7
POWER, BHP*	31.3	31.3	19.3	19.3	7.8	7.8
FUEL RATE, LB/HR	16.2	16.1	13.0	13.0	9.8	9.8
IGNITION TIMING, DEG BTDC	49.5	49.5	50.0	50.0	50.0	50.0
MANIFOLD VACUUM, IN HG	12.1	12.1	15.2	15.2	18.3	18.3
THROTTLE ANGLE, DEG	26.5	26.5	21.1	21.1	15.8	15.8
INTAKE MAN. TEMP., F	100	100	114	114	135	135

CONCENTRATIONS, DRY BASIS

CO, %	.1109	.0008	.1860	.0020	.5776	.0531
CO2, %	13.51	13.76	13.77	14.16	13.89	14.54
O2, %	1.54	1.35	1.16	.81	.79	.26
HC, PPMC	1329	31	1491	42	1596	22
NOX, PPM	2581	2666	1278	1363	386	219
AIR/FUEL RATIO	15.81	15.87	15.42	15.42	14.93	14.97

EMISSION RATES, G/HR

CO	116.5	.8	152.0	1.7	346.2	31.6
HC	70.1	1.6	61.2	1.7	48.0	.7
NOX+	388.5	403.7	152.4	162.0	32.8	18.5
OIL TEMPERATURE, F	248	248	243	243	238	238
OIL PRESSURE, PSI	53	53	53	53	48	48
COOLANT TEMPERATURE, F	188	188	187	187	187	187
EXHAUST PRESSURE, IN. H2O	33.0	16.0	21.0	.0	13.0	.0
EXHAUST TEMPERATURE, F	1296	1109	1225	1067	1213	1042

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO₂, %

O₂, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H₂O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

103.1	103.2	104.1	104.2	105.1	105.2
3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77
745.7	745.7	745.7	745.7	745.7	745.0
41	41	41	41	41	41
84	84	84	84	84	84
3500	3500	4300	4300	4300	4300
1.3	1.3	1.6	1.6	11.2	11.2
9	9	1.3	1.3	9.1	9.1
8.2	8.2	10.9	11.0	12.5	12.5
50.0	50.0	55.0	55.0	54.0	54.0
19.8	19.8	19.2	19.1	17.5	17.5
13.5	13.5	17.8	17.8	20.2	8
150	150	128	128	118	118
8678	3889	3404	0028	1962	0573
13.74	14.47	13.53	14.30	13.73	14.66
62	02	1.25	53	1.18	05
1793	110	3382	25	1348	21
153	53	287	365	580	177
14.66	14.65	15.17	15.19	15.42	14.82
427.0	190.5	231.3	1.9	155.1	43.3
44.3	2.7	115.4	8	53.5	8
10.7	3.7	27.6	35.4	65.1	19.0
235	235	250	250	254	254
53	53	55	55	55	55
185	185	189	189	189	189
9.0	6.0	16.0	8.0	21.0	10.0
1213	1021	1326	1143	1348	1099

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER	106.1	106.2	107.1	107.2	108.1	108.2
TEST DATE	3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77
BAROMETER, MMHG	743.3	743.3	743.3	743.3	743.3	743.3
HUMIDITY, GRAINS/LB	38	38	41	41	41	41
TEMPERATURE, F	83	83	85	85	86	86
ENGINE SPEED, RPM	4300	4300	4300	4300	4300	4300
TORQUE, FT-LB	28.0	28.0	44.8	44.8	84.0	84.0
POWER, BHP*	22.9	22.9	36.7	36.7	68.9	68.9
FUEL RATE, LB/HR	16.3	16.4	20.4	20.4	33.3	33.4
IGNITION TIMING, DEG BTDC	52.0	52.0	50.0	50.0	35.5	35.5
MANIFOLD VACUUM, IN HG	14.7	14.7	11.0	11.0	3.8	3.8
THROTTLE ANGLE, DEG	25.1	25.1	32.4	32.4	51.1	51.1
INTAKE MAN. TEMP., F	92	92	87	87	69	69

CONCENTRATIONS, DRY BASIS

CO, %	.1366	.0029	.1156	.0033	1.1741	.0745
CO2, %	13.32	13.53	12.98	13.16	13.30	14.63
O2, %	1.86	1.71	2.24	2.11	.99	.26
HC, PPMC	593	17	649	17	1035	10
NOX, PPM	1628	1617	2758	2692	2755	1310

AIR/FUEL RATIO

	16.09	16.10	16.46	16.48	14.93	15.00
--	-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	147.0	3.1	159.6	4.6	2387.5	151.9
HC	32.2	.9	45.0	1.2	105.7	1.0
NOX+	245.3	244.5	540.8	526.9	795.4	379.1

OIL TEMPERATURE, F	246	246	263	263	269	269
OIL PRESSURE, PSI	56	56	55	55	54	54
COOLANT TEMPERATURE, F	188	188	191	191	192	192
EXHAUST PRESSURE, IN. H2O	35.0	14.0	54.0	24.0	120.0	53.0
EXHAUST TEMPERATURE, F	1327	1121	1388	1188	1613	1469

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER
FUEL CODE: 7619

TEST NUMBER	109.1	109.2	110.1	110.2	111.1	111.2
TEST DATE	3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77
BAROMETER, MMHG	743.3	743.3	743.3	743.3	743.3	743.3
HUMIDITY, GRAINS/LB	41	41	41	41	41	41
TEMPERATURE, F	87	87	88	88	88	88
ENGINE SPEED, RPM	5000	5000	5000	5000	5000	5000
TORQUE, FT-LB	76.5	76.5	40.8	40.8	25.5	25.5
POWER, BHP*	73.0	73.0	39.0	39.0	24.4	24.4
FUEL RATE, LB/HR	39.0	39.1	24.5	24.5	19.6	19.6
IGNITION TIMING, DEG BTDC	35.0	35.0	52.0	52.0	54.0	54.0
MANIFOLD VACUUM, IN HG	2.9	2.9	10.2	10.2	13.9	13.9
THROTTLE ANGLE, DEG	55.6	55.6	36.5	36.5	29.6	29.6
INTAKE MAN. TEMP., F	64	64	87	87	96	96

CONCENTRATIONS, DRY BASIS

CO, %	.7868	.0045	.1277	.0045	.1329	.0022
CO2, %	13.23	13.92	12.78	12.93	13.10	13.31
O2, %	1.26	1.04	2.41	2.38	2.05	1.92
HC, PPMC	256	2	796	15	511	82
NOX, PPM	2043	1982	2605	2575	1664	1648

AIR/FUEL RATIO

	15.36	15.61	16.57	16.71	16.27	16.28
--	-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO	1931.7	11.3	213.0	7.6	173.5	2.9
HC	31.5	.3	66.7	1.3	33.5	5.4
NOX+	712.2	702.2	616.9	614.3	308.4	306.2

OIL TEMPERATURE, F	263	263	281	278	278	278
OIL PRESSURE, PSI	55	55	54	54	54	54
COOLANT TEMPERATURE, F	192	192	190	190	188	188
EXHAUST PRESSURE, IN. H2O	174.0	78.0	78.0	34.0	52.0	22.0
EXHAUST TEMPERATURE, F	1683	1529	1488	1275	1450	1229

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

112.1	112.2	113.1	113.2	123.1	123.2
3/ 8/77	3/ 8/77	3/ 8/77	3/ 8/77	3/10/77	3/10/77
743.3	743.3	743.3	743.3	734.2	734.2
41	41	41	41	61	61
87	87	87	87	90	90
5000	5000	5000	5000	5300	5300
10.2	10.2	1.0	1.0	90.0	90.0
9.7	9.7	1.0	1.0	92.8	92.8
16.2	16.3	13.9	14.0	50.6	50.6
54.0	54.0	55.0	55.0	35.0	35.0
16.5	16.5	18.0	18.0	1.7	1.7
23.5	23.5	21.9	21.9	79.0	79.0
106	106	118	118	63	63

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

.1325	.0031	.2332	.0031	3.8901	3.9101
13.54	14.15	13.67	14.15	12.04	12.17
1.43	.69	1.22	.69	.20	.09
1434	17	3317	17	1777	1136
850	480	451	480	1645	1655

AIR/FUEL RATIO

15.64	15.30	15.21	15.30	13.16	13.15
-------	-------	-------	-------	-------	-------

EMISSION RATES, G/HR

CO

HC

NOX+

137.8	2.7	202.1	2.7	10657.1	10691.8
74.9	.8	144.4	.8	244.5	156.0
125.6	59.7	55.5	59.7	696.0	698.9

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

271	270	270	270	293	293
54	55	55	55	53	53
188	189	189	189	192	192
36.0	27.0	27.0	11.0	202.0	94.0
1444	1466	1466	1251	1640	1432

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1977 FORD 2.3 LITER 4 CYLINDER

FUEL CODE: 7619

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

153.1
3/24/77
742.0
48
77
1000
-12.0
2.3
1.7
21.0
20.5
0
122

153.2
3/24/77
742.0
48
77
1000
-12.0
2.3
1.7
21.0
20.5
0
122

154.1
3/24/77
742.0
48
78
1500
-19.8
5.6
1.9
22.0
23.0
0
123

154.2
3/24/77
742.0
48
78
1500
-19.8
5.6
1.9
22.0
23.0
0
123

155.1
3/24/77
742.0
48
78
2000
-21.6
8.2
1.8
24.0
24.0
0
129

155.2
3/24/77
742.0
48
78
2000
-21.6
8.2
1.8
28.0
24.0
0
129

CONCENTRATIONS, DRY BASIS

CO, %
CO2, %
O2, %
HC, PPMC
NOX, PPM

.0000
8.28
9.00
1
8

.0000
6.63
11.38
1
7

.0000
12.26
3.50
484
21

.0000
7.33
10.63
1
8

.0000
12.02
3.75
314
17

AIR/FUEL RATIO

25.48

17.85

31.65

17.54

29.04

17.83

EMISSION RATES, G/HR

CO
HC
NOX+

.0
1.2
.5

.0
.0
.3

.0
3.3
.4

.0
.0
.3

.0
2.1
.3

OIL TEMPERATURE, F
OIL PRESSURE, PSI
COOLANT TEMPERATURE, F
EXHAUST PRESSURE, IN. H2O
EXHAUST TEMPERATURE, F

182
44
176
3.0
558

182
44
176
1.0
556

182
46
176
4.0
502

182
46
176
4.0
795

189
50
178
4.0
786

189
50
178
4.0
926

* CORRECTED SAE J8168
+ CORRECTED FOR HUMIDITY

HE 18.5.A34
no: DOT-TSC-
NHTSA- 78-16

BORROW

Form DOT F 1
FORMERLY FORM



00347264

U. S. DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SYSTEMS CENTER
KENDALL SQUARE, CAMBRIDGE, MA. 02142

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, \$300



POSTAGE AND FEES PAID

U. S. DEPARTMENT OF TRANSPORTATION

513